

UNITED STATES PUBLIC HEALTH SERVICE

RUPERT BLUE, SURGEON GENERAL

# THE ADMINISTRATION OF A YELLOW FEVER CAMPAIGN

BY

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## THE ADMINISTRATION OF A YELLOW FEVER CAMPAIGN.

By W. C. RUCKER, Assistant Surgeon General, United States Public Health Service.

### First Principles.

As early as 1881 Dr. Carlos Finlay, of Habana, expressed the belief that yellow fever was propagated by the mosquito, the infecting agent being transferred on the proboscis of the insect. The theory of the mosquito transmission of yellow fever was not placed on a scientific basis, however, until 19 years later, when a commission from the United States Army, headed by Maj. Walter Reed, completed its classical experiments in Cuba. The following year the commission expressed its conclusions in 11 postulates as follows:

1. The mosquito, *Culex fasciatus*, serves as the intermediate host for the parasite of yellow fever.
2. Yellow fever is transmitted to the nonimmune individual by the bite of the mosquito that has previously fed on the blood of those sick with this disease.
3. An interval of about 13 days or more after contamination appears to be necessary before the mosquito is capable of conveying the infection.
4. The bite of the mosquito at an earlier period after contamination does not appear to confer any immunity against a subsequent attack.
5. Yellow fever can also be experimentally produced by subcutaneous injection of blood taken from the general circulation during the first and second days of the disease.
6. An attack of yellow fever produced by the bite of the mosquito confers immunity against the subsequent injection of the blood of an individual suffering from the nonexperimental form of this disease.
7. The period of incubation in 13 cases of experimental yellow fever has varied from 41 hours to 5 days and 17 hours.
8. Yellow fever is not conveyed by fomites, and hence disinfection of articles of clothing, bedding, or merchandise, supposedly contaminated by contact with those sick of this disease, is unnecessary.
9. A house may be said to be infected with yellow fever only when there are present within its walls mosquitoes capable of conveying the parasite of this disease.
10. The spread of yellow fever can be most effectually controlled by measures directed to the destruction of mosquitoes and the protection of the sick against the bites of these insects.
11. While the mode of propagation of yellow fever has now been definitely determined, the specific cause of this disease remains to be discovered.

The truth of these statements has been proven by many different observers in widely separated places and under varying conditions, and the epidemiology of yellow fever is now based entirely on the mosquito dogma. For practical purposes this may be reduced to three postulates upon which rests the entire plan of yellow fever campaign.

1. Yellow fever is transmitted only by the *Stegomyia (Aedes) calopus*. (στέγος-roof or house; μύια-fly; κάλος-beautiful; πῑδίων-foot.)

2. This mosquito is infected only by biting a yellow-fever patient in the first three days of the disease.

3. A mosquito so infected can not transmit the infection until a period of from 12 to 20 days, usually 14, has elapsed.

#### Objects of the Campaign.

Reasoning from these premises, the fundamental objects of the campaign are—

1. Prevent the breeding of the *Stegomyia (Aedes) calopus*.

2. Locate all persons sick of yellow fever or suspicious fever as early as possible in the disease.

3. Prevent *Stegomyia (Aedes) calopus* from biting them and becoming infected.

4. Destroy all infected *Stegomyia (Aedes) calopus*.

#### Commanding Officer.

While the principles underlying the extermination of yellow fever are always the same, the plan of campaign will vary with local conditions; the area of the infected territory, whether it be urban, suburban, or rural; the degree of cooperation on the part of the State and local health authorities, and the attitude of the citizens of the infected and adjacent States. If the infection be localized, the command of all sanitary operations may be vested in a single officer who is responsible for the administration of the entire campaign. On the other hand, if the infection is widespread, or if there is great danger of it so becoming, it may expedite matters to have the work divided among several senior officers, each of whom controls a certain territory or phase of the work.

#### Arrangements with Local Health Boards.

An officer assigned the command of a certain district or territory should first call on the health authorities therein and have a definite understanding with them of the work each will undertake and the amount of cooperation they will afford. It is well also to attend the local medical society at the first opportunity in order that the efforts of the Federal forces may not be misunderstood. A little tact and caution in this regard will promote harmony and save a great deal of unpleasantness and misunderstanding later on.

#### Headquarters.

Having arrived at a definite and satisfactory understanding with the local health authorities, the next duty of an officer commanding a large city and adjacent rural districts is to establish his headquar-

ters in a central location with ample telephone and telegraph connections. His immediate staff consists of an executive officer and the chiefs of the divisions of disbursements, statistics, medical supplies or purveying division, and train inspection. If the latter division is not given charge of the detention camps, a division of detention camps should be added.

#### **Executive Officer.**

The executive officer conducts the executive division; has control of the office force; the preparation and issuance of the commanding officer's orders and the receipt of all reports; the preparation of all letters requiring the commanding officer's signature; the filing of all letters and other papers; and the checking of all accounts and bills prior to their submission to the commanding officer for his signature. All orders emanating from the executive officer are issued "by direction of the commanding officer." The executive officer employs all clerks and stenographers for the office and is responsible for their discipline. Their number will depend entirely upon the amount of work in hand. They should be kept at the minimum compatible with efficiency. The office should be furnished as economically as possible, and if the work is of any amount, several typewriters and one mimeograph will be required. The latter is used chiefly in preparing general orders and the daily report to the wards of the names and addresses of all positive and suspicious yellow-fever cases and deaths. A large map of the entire district showing the progress of the epidemic should be maintained at headquarters.

#### **The Field Force.**

With regard to the employment of the field force, the writer has seen two systems in operation. During the 1905 yellow-fever eradication campaign in New Orleans the initial supply of laborers was employed by the executive officer, and additional laborers were employed by the medical officers in charge of wards. During the 1907 plague eradication campaign in San Francisco all employees were hired by the executive officer. It is believed that the latter system is better.

Care should be taken by the executive officer to examine carefully all of the credentials presented by the various candidates for appointment, and these should be kept together and labeled with the owner's name, as in many instances they are valuable papers with which the owner is loath to part. Great care should be exercised to exclude the physically unfit and persons who by reason of their habits would not render efficient service. Pains should be taken to exclude from employment alcoholics, persons suffering from drug addictions, vagrants, the aged, and people who give a record of having served in

many occupations which they have left by reason of discharge or general unfitness or incompatibility. The endeavor should be to select clean, bright, alert, frank-looking men. In no instance should appointments be made because of political connections or at the solicitation of charitable institutions, and in no case should any person be employed who has not been thoroughly looked over.

The field force is usually secured without much difficulty, as an epidemic throws many men out of employment. Many will apply who are not fitted in any way for the work, simply basing their claim for employment on some influence, political or otherwise. It is rarely wise to employ them, even if by doing so the backing of some influential citizen can be obtained. They upset discipline and are disturbing factors generally.

Secure, first, men suitable for inspectors. Bright young clerks are best for this work. Medical students have been found totally unfit for such positions. They feel themselves above the position and their fellow laborers. For foremen in the field force men should be selected who have had some experience in handling small bodies of men and at the same time have learned how to get on with the general public. Street car conductors and motormen are especially desirable for this work. The workmen should be a little above the scale of intelligence of the average laborer, but physically able to stand up to the work. Whites are very much to be preferred. Soldiers and sailors having "excellent" discharges make good employees. It has not been found necessary to employ immunes exclusively. In a badly infected ward during the New Orleans epidemic of 1905, in a sanitary company averaging 100 men only two cases of yellow fever developed. These were traced to the residences of these men and were probably not contracted in the ward. This may be explained by the fact that the *Stegomyia (Aedes) calopus* does not ordinarily bite in bright sunlight, the only time the ward field force is at work.

As soon as a person is selected for employment he should be given a note to the ward commander, stating his name and the date on which employment is to begin. In order to prevent the sale or exchange of these notifications the employee's thumb print should be placed on the edge of the paper. He should then be directed to report immediately to the officer in charge of the ward. In assigning such persons to work care should be taken that they are not stationed in the ward in which they live, as in this way favoritisms on account of friendships may be avoided. Officers in charge of wards should be given full authority to discharge immediately and without the preferment of charges any employee whose work is not satisfactory.



### Division of Disbursements.

The division of disbursements receives all moneys and makes payments on payrolls and bills which have been previously certified by the officer responsible for the expenditure and viséd by the commanding and executive officers. It has been found wise to pay the entire field force weekly. Bills and pay rolls, on forms similar to those used by the service, are submitted every Saturday afternoon and checks in payment therefor are given to the division and ward commanders Monday afternoon, their receipt for the checks being taken. This does not refer to commissioned officers and others who are paid by the Federal Government. Their monthly pay rolls and expense vouchers are made up by a pharmacist or clerk who looks after these accounts. As the division of disbursements is concerned chiefly with the administration of funds raised by the people of the infected territory, its chief should be some local bonded accountant capable of keeping the books and managing the funds in an orderly manner.

### Division of Statistics.

This division receives all reports of cases and tabulates them. The following has been found an ample force for such a division in a large epidemic:

- 1 chief.
- 1 chief clerk.
- 1 ward telephone clerk.
- 1 general telephone and information clerk.
- 1 stenographer.
- 1 files clerk.
- 1 messenger.

The office of this division should have two telephones, one of which is for exclusive use in telephoning to or receiving messages from the wards, the other for the receipt and transmission of all other messages.

Information is received from the following sources: Private physicians, the local board of health (in most States the law requires immediate notification to this body of all yellow-fever cases), the wards, hospitals (private and public), the police, and the general public, rumors, etc. In a large city, it has been found a good plan for the ward headquarters to call up the division of statistics every hour and report any cases which the ward may have found. At the same time, the division of statistics reports to the ward any cases in its territory of which the division may have had reports from other sources, requests for fumigation, rumors, etc. One or two clerks are necessary for this purpose alone. A record should be kept of all such telephonic messages received or transmitted. As soon as a report of a case is received, the facts concerning it are entered on a

blank<sup>1</sup> provided for the purpose and the time of receipt noted thereon. If the report is not full or seems inaccurate, nothing more is done to it until the ward has investigated it. The time that the case is reported to the ward is noted on this report. Having secured a complete report on the case, it is entered in the card index. This should be a cross index, tabulated by the name of the patient, the street and number, and the attending physician. There are separate files for each of these, both by suspicious and positive cases.<sup>2</sup> Also there is another file for the cases treated in the yellow-fever hospital, another for deaths, and still another for deaths in hospitals, arranged by street of origin.<sup>3</sup> This card system is especially valuable. It is more expensive than books, but this is offset by compactness, ease of filing, and rapidity and accuracy of reference. In order to prevent error on account of the different spellings which inspectors may give to foreign or unusual names, the elaborate cross-index system is absolutely necessary.

At the end of each day a complete list of the cases discovered that day is made out. This should show the name and address of every positive or suspicious case, the physician attending, the name and address of all persons dying of yellow fever, and the name of the undertaker.

This complete report is mimeographed and copies of it are sent to every ward commander. The division of statistics also compiles a report for the commanding officer to issue to the press if he so wishes. This should include new cases, deaths, new foci, total cases, total deaths, cases under treatment, and news items of general interest. It is a good idea for this division also to maintain a large map on which the progress of the epidemic is noted by coloring each square in which a case of yellow fever occurs. Pushpins having colored heads serve the same purpose. A distinctive color should be used for each month.

#### Purveying Depot.

The purveying depot should be centrally located and should present good office room and adequate storage facilities. If possible, it should be so arranged that the storerooms have several exits in order that two or more wagons may be loaded at once. The management of this division requires keen judgment and especially good business training. The office force should comprise at least the following:

- 1 chief.
- 1 chief clerk.
- 1 files clerk.
- 1 telephone clerk.
- 1 or 2 bookkeepers.
- 1 messenger.

<sup>1</sup> Appendix, Form 1.

<sup>2</sup> Appendix, Forms 2, 3, 4, 5, and 6.

<sup>3</sup> Appendix, Forms 7, 8, and 9.



In the warehouse one storekeeper and two assistants should be kept. Two wagons and drivers should also be hired. An automobile truck, if available, will save both time and money.

At the beginning of the campaign, proposals should be secured for the various materials required for the campaign. In this way a price is fixed before the supply has been cornered. Whenever it can be done without extra expense, an arrangement should be made to have goods delivered in small lots as required. This does away with the necessity of keeping a large stock on hand, and prevents overloading with supplies or great loss in case of fire. All goods should be inspected immediately on delivery, and those not up to standard rejected. Great care should be taken in looking over wire screening. For this purpose a small magnifying glass having an aperture at the focal point exactly 1 inch square should be secured. With it the meshes in the wire netting can be counted and the exact number per inch determined. Those falling below 18 to the square inch should be refused.

#### Requisitions.

Wards requiring supplies make out requisitions in duplicate.<sup>1</sup> One is retained by the ward and the other forwarded to the purveying depot. If the ward can supply a wagon for the delivery of the goods, it should be encouraged to do so. This facilitates rapid delivery of supplies and does away with the necessity of a large wagon force for the purveying depot and consequently results in a large saving of money. After the requisition has been filled it is filed in an envelope file until the end of the calendar month, when it is transferred to a drawer set aside for the business of the ward ordering the supplies. Receipts<sup>2</sup> are signed in triplicate by the ward commander. One copy is retained for his files, one given to the driver delivering the goods, and the other returned to the purveying division. Receipts are filed with the filled requisitions. Record should be kept of all goods requisitioned for by telephone and written requisitions obtained afterwards. No goods should be delivered without receipts being taken. A card index<sup>3</sup> of all goods ordered from contractors is maintained.

A double-entry set of books should be maintained and all running accounts settled monthly. Bill forms should be the same as those used by the other divisions. The management of the purveying depot is essentially a business proposition and should be run as such. Unless accounts are kept carefully, goods issued only on requisition and receipts taken therefor, things get into a tangle which may reflect on the honesty of the officer having charge of this work.

<sup>1</sup> Appendix, Form 10.

<sup>2</sup> Appendix, Form 11.

<sup>3</sup> Appendix, Form 12.

### Division of Train Inspection.

The division of train inspection has charge of all traffic arrangements, both freight and passenger. Freight of all kinds, except bananas and other fruit liable to harbor *Stegomyia (Aedes) calopus*, may freely leave infected districts, providing the cars are thoroughly fumigated prior to loading and due care is observed that mosquitoes are not included in the freight to be shipped. Cars should be made smoke proof and exposed to 2 per cent sulphur dioxide gas for two hours and then sealed. Each car should bear a placard showing date of fumigation. Not more than 24 hours should elapse between fumigation and loading. Pullman sleeping cars leaving infected centers should be screened, and fumigated at the end of each run. As sulphur is liable to do serious injury to the plush and other fabrics of these cars, camphor-phenol or pyrethrum may be used in their fumigation. Care should be taken that mosquitoes are not taken from these cars in soiled bedding.

The name and address of all persons entering infected cities should be taken by inspectors and for five days thereafter they should be inspected at their place of residence by the inspectors of the ward in which they live. This prevents the introduction of fresh yellow fever cases into the infected city.

Persons leaving the infected city should obtain a certificate from the division of train inspection showing that they have not been exposed to infection for the past six days. To render the certificate nontransferable, the thumb-mark system is especially valuable.

### Detention Camps.

By using detention camps, free migration from infected cities may be allowed; in fact, when a certain proportion of the population becomes panicky it is much better that they leave. They are simply a hindrance to sanitary measures and infect with fear the remaining population, who might otherwise retain their self-possession and be of assistance to the sanitary authorities. The objects of detention camps are twofold—first, to provide a means of egress for non-immunes from a locality infected with yellow fever, and thus reduce the sources of continued propagation of the disease, and, second, to hold such persons under observation for a limited period with frequent daily inspections as to their physical condition, so as to prepare them to proceed to their destination uninfected, whether that place be infectible or noninfectible. Detention camps to be effective must be as easy of access and as comfortable as existing conditions will possibly permit. Every additional facility and comfort accorded the detained lessens by so much the probability of their attempting illicit exit. To this end, such camps should be located on the main

line of a railroad at a suitable distance from the infected locality. The selection of a camp site and the sanitary administration of it are the same as govern that of any military camp. The location should be as free as possible from the *Stegomyia (Aedes) calopus*. It should be clean, dry, with well-drained soil and an abundant supply of potable water. The camp buildings should be comfortable and easily fumigated. If buildings are constructed, the layout should be in the form of a hollow square, and should include an administration building, cookhouses, dining rooms, a trunk room, a small hospital with an attached disinfection room, officers' quarters, and living apartments for the detained. Different races should be segregated. Single women should be placed under the care of some of the married members of their sex. Ample telegraphic and telephonic communication should be established. The entire camp should be inclosed in a wire fence 10 feet high, surmounted by barbed wire. A patrol of guards is maintained outside the fence.

Tents are not as good as wooden buildings, but if they are used they should be constructed of khaki-brown cotton and placed on wooden platforms. The tents should be properly screened and bed nets should be used. The unit of equipage consists of—

- 1 collapsible cot, 2 feet 6 inches by 6 feet 6 inches, with wire mattress.
- 1 cotton mattress.
- 1 double blanket.
- 1 bed net.
- 1 plate.
- 1 knife.
- 1 fork.
- 2 sheets.
- 1 pillow.
- 1 pillowcase.
- 1 cup.
- 1 saucer.
- 1 spoon.

Latrines should be built over trenches on the outskirts of the camp at the greatest possible distance from the cookhouses and dining rooms. Excrement incinerators are better than latrines. They are not expensive and if properly managed are very efficient. They should be screened, as should also the latrine houses. They should be easily accessible to the guards. Latrines should be limed every hour of daylight and inspected twice daily by the officer of the day.

A simple garbage destructor should be built and all garbage burned therein.

When practicable the camp should be lighted by electricity.

A roster of the detained should be kept. Their temperature should be taken twice daily and noted in a book kept for the purpose. After six days' detention, those discharged should be provided with a certificate showing their condition at the time of discharge.

To relieve the tedium of camp life, games and athletic sports should be organized. Frequent informal talks should be given on the transmission of yellow fever. These should be illustrated by a stereopticon if possible, but if this is not practicable, pictures or drawings may be passed from hand to hand, thus serving to fix the lecture in the minds of the hearers and to explain it more fully. The camp thus becomes a center of education and aids very materially in the dissemination of the mosquito doctrine.

The number of the personnel of the camp depends upon the number of inmates. The following is considered an ample force with which to begin operations:

- 1 commanding officer.
- 1 pharmacist.
- 1 baggage-master.
- 3 cooks.
- 10 guards.
- 1 or 2 junior officers.
- 1 matron.
- 1 telegraph operator.
- 6 mess boys (also do chamber work).

#### Isolation Hospital.

In infected cities and towns, it is frequently necessary to establish a hospital for the treatment of yellow-fever cases which can not, for some reason or other, be cared for in their own homes. Aside from the slight modifications which the mosquito dogma imposes, the general plan of such a hospital does not materially differ from one for the treatment of ordinary ailments. Special attention should be paid to ventilation and lighting and a building chosen close to the center of greatest infection, in order that patients may be moved thereto with the least possible injury. Patients should be transferred in a carefully screened ambulance. The hospital should be liberally supplied with noiseless electric fans and made as comfortable as circumstances will allow. "Dark and somber surroundings depress and agitate by frightening the sick, while well-lighted, clean, and cheerful wards, by giving a sense of interest and care in all things, produce an effect of security and tranquillity of the greatest importance in the management and treatment of yellow fever." Wards, therefore, should be light and airy, but no color should be used in tinting the walls or window shades that will prevent the easy recognition of jaundice. Eighteen-mesh wire screening should cover all windows, ventilation ports, and other places through which mosquitoes might find ingress or egress. To make assurance doubly sure, mosquito bars should cover each bed. In addition to fine wire screening, windows should be covered with strong half-inch wire netting. This prevents injury to the finer netting and is far preferable

to iron bars in preventing patients from jumping through the windows in their delirium, as it does not produce the depressing feeling of forcible restraint. It is better to have only one door leading to the open air. This should be protected by a long storm shed, having at least two screen doors and several strong electric fans blowing outward. Small wards are preferable. As the emotional element plays such an important role in the disease, every effort should be made to shield patients from the horrors incident to very severe cases by having small rooms off the wards in which very delirious or dying patients may be placed.

The hospital should at all times be open to the profession and their visits welcomed and encouraged. Friends and relatives should be allowed to see patients, whose condition permits, during visiting hours, not only for the consolation they may give or receive but because this is one of the best demonstrations we can give of our absolute confidence in the mosquito doctrine. During the New Orleans epidemic of 1905, several thousand nonimmune persons visited the hospital without a single case developing which was there contracted.

Laundry may be sent out without fear, provided it is first inspected to make sure that it holds no mosquitoes. There is no reason for employing immunes exclusively as nurses and attendants. On account of the constant attention which yellow-fever patients require and the great importance of good nursing in the treatment, more nurses should be supplied than is the rule in ordinary diseases. The ratio should not be greater than four patients to each nurse. On account of the valuable opportunities for studying the disease, the hospital should be supplied with a good laboratory and necropsy room, and careful clinical histories kept of all cases. Officers who are not familiar with the post-mortem aspects of yellow fever should be encouraged to attend the autopsies. In a similar way, they should see as many cases in hospital as possible, in order that they may have a first-hand knowledge of the disease which will enable them to diagnose doubtful cases.

#### The Wards.

The city should be divided into wards and an officer placed in charge of each. He first locates his headquarters in a central and easily accessible part of his ward, choosing, if possible, a building with a good-sized storeroom, and sets about hiring his office and field force. The number of these will vary with the size of the ward and the distribution of the infection therein. It should be kept at the minimum compatible with the prompt and rapid execution of the work in hand. The following is an ample office force for a large and badly infected ward:

One superintendent, who maintains a general supervision of the fieldwork, especially of fumigation.



One chief clerk, who attends to the correspondence, accounts, the files, and the general office work, including the receipt and transmission of telephonic messages.

One clerk, who keeps the card index of the sanitary survey and cases, and files the records of fumigation and screening.

One storekeeper, who receives and issues all supplies and generally keeps track of the "property," and furnishes the ward commander with the lists of supplies needed from time to time.

One office boy.

The office must be furnished. This should be done very cheaply. Besides desks for the ward commander and the office force, there should be one or two set aside for foremen. Requisition should also be made for stationery and blanks, and a typewriter rented. A telephone should be installed at once. The office should be arranged so that there is a private room in which the ward commander may receive physicians or citizens who may wish to make reports or complaints. Everyone must be treated with the utmost courtesy and tact and the idea impressed upon them that the sanitary forces are there for the purpose of assisting them with as little annoyance as possible. It is important to secure, if possible, the hearty cooperation of all householders, and every complaint, no matter how trivial, demands courteous attention.

In doing a large amount of fumigation, a certain amount of injury to property is inevitable. This must be reduced to the minimum by the use of anhydrous sulphur dioxide, camphor-phenol, or pyrethrum, whichever one is indicated, in the most careful manner. All claims for damages so incurred should be received and forwarded to the commanding officer with a full statement of the case, and his decision reported to the complainant. A small fund should, if possible, be set aside by the commanding officer from the yellow fever fund for the settlement of these claims.

If the ward is a particularly lawless one, it is advisable to request the chief of police to attach one or two policemen to the ward headquarters. They are very rarely needed to make arrests, but their mere presence exercises a strong moral influence on the recalcitrant citizen.

In the office, all clerical work must be done in an orderly manner. Copies must be kept of all letters sent or received, of requisitions, receipts, and reports. For this purpose, Shipman files have been found useful, carbon copies being taken of all letters and reports and simply pasted into the file.

A card index of the sanitary survey should be kept up to date. The cards should be arranged according to street and number and are very valuable for reference when tracing sources of infection or spread of the fever. They are the same as those used at general headquarters. A similar card index is maintained of the positive and suspicious yellow fever cases. This is a cross index, one set being



arranged according to street and number, and the other with reference to the patient's surname. Positive cases are entered on a yellow card, suspicious cases on a white card. If they are proven negative, they are allowed to remain on the white card, the proper diagnosis being written across the face of the card in red ink. If they are proven positive, they are transferred to a yellow card. In addition, it is well to maintain also a map in which different colored pins are placed each day to show the advance or recession of the epidemic in the ward.

The chief clerk should keep a time book, showing the number of days, the amount of overtime served by each employee, and the wages due him therefor. This should be balanced each week when the pay rolls are made out. The usual allowance for overtime is double pay for each hour or fraction thereof after 6 p. m.

The medical part of the work can be done by one officer and one or two medical assistants. For the latter, young physicians have been found best. They are bright and keen and have the vitality necessary for the work. They are employed in diagnosing cases which have no medical attendant, or about which there is some indecision or dispute; in inspecting screening and other work done by the ward forces. If the ward covers a considerable area, they should be mounted. This applies also to the superintendent. Saddle horses furnish a rapid and inexpensive means of transportation, especially adapted to rough or narrow roads where a buggy or a light automobile could not well go. If the ward is a large one, much time may be saved by the use of a light automobile of the "Roadster" type by the ward commander. This should be used for official purposes only, and the chauffeur should keep a record in a book provided for the purpose of each trip made, its mileage, and by whose orders. This should be balanced each week against the gasoline and oil accounts.

#### The Sanitary Survey.

As soon as inspectors can be secured, they should be placed at work on the sanitary survey of the ward. This should be done rapidly and thoroughly. The ward should be divided into districts and detailed information secured regarding the street and number of each house, the name of the householder, the number of cisterns and other water containers, whether oiled or screened, the general sanitary condition of the premises, and the occurrence of sickness within the preceding two weeks. The inspector records this information on the inspection blank,<sup>1</sup> which is copied in the office and placed in the card index.<sup>2</sup> Reinspections should be made at frequent intervals, but on no account should they be made an annoyance to householders. If

<sup>1</sup> Appendix, Form 13.

<sup>2</sup> Appendix, Form 14.

they realize that they are being given the utmost consideration which the situation allows, they will be less liable to conceal their cases and resist antimosquito operations. Inspectors should be given a small metal badge having thereon "Sanitary Inspector, U. S. Public Health Service," or some similar device, and a number. This identifies the wearer and prevents sneak thieves from taking a notebook and gaining entrance to houses under the guise of an inspector. These badges should be taken up on the discharge of the holder. Careful watch must be kept on inspectors until they have proven their reliability. There is a certain temptation for them to fill in the blanks with names and information drawn from their inner consciousness, and it is well for the ward commander or one of his assistants to visit districts under inspection at unexpected times and occasionally to check a few blanks from each of the inspectors by personal visits to inspected houses.

#### Initial Requisition.

While the inspectors are getting this data together the ward commander should begin getting in his supplies for the prosecution of the remainder of the work. In the appendix will be found a reasonable requisition for beginning the sanitary operations.<sup>1</sup> To it should be added such blanks, pay rolls, and other papers as may be designated by the commanding officer. It is well to always keep on hand a good supply of the articles named and the storekeeper should be instructed to keep accurate account of his stock and furnish the ward commander with a list of supplies which are running low several days prior to their exhaustion in order that the medical purveyor may be given time in which to secure them. It also helps the medical purveyor in that in this way he is not obliged to keep a large stock on hand, but can bunch several requisitions and thus get a better price for purchasing in large quantities.

#### Care of Property.

The storekeeper should be required to keep a "rough" and a "smooth" property book. In the former is kept a record of all supplies received and issued. In the latter is kept a record of the non-expendable property. In epidemic times, well-nigh all supplies may be considered expendable, and, of course, a certain amount of material is unavoidably lost, but this is no excuse for wasting property which at the close of the campaign may be stored against another epidemic or may be sold. In speaking of the "smooth" property return, nonexpendable is used in the sense of not usually expended, and includes sulphur pots, screen doors, bobbinet, and such articles, which should not be lost and which may be of value at the close of the campaign.

<sup>1</sup> Appendix, Form 15.

### Prevent Mosquito Breeding.

Having gotten in a stock of supplies, the first of the fundamental objects of the campaign begins, i. e., "Preventing the breeding of *Stegomyia (Aedes) calopus*." To accomplish this an understanding of the life, history, and habits of this mosquito is necessary.

#### The *Stegomyia (Aedes) calopus*.

For an entomological description of the *Stegomyia (Aedes) calopus* the reader is referred to any modern entomology. It is sufficient to say here that it is a mosquito having alternate stripes of intense black and pure white upon the legs, two white curved bands on each side of the thorax, and transverse white bands upon the abdomen. This insect is a domestic mosquito and generally breeds in and around human habitations. It oviposits by preference in fresh, clean, quiet water, but when these are not at hand it has been known to breed in foul water. Its common breeding places are cisterns, rain-water barrels, tin cans, the broken bottles on the tops of walls, in the space above the chimneys of a barrel, the holy-water fonts in churches, fountains which contain no fish, the sag of a roof gutter, in cemetery urns, in water seals in idle plumbing, in horse troughs, and in the cup formed by the junction of the leaves with the stem in certain plants of the agave family. It will breed anywhere in and around houses where there is fresh, clean, quiet water. The eggs resist drying very well, and in from 10 to 24 hours (depending on temperature) after being laid in fresh water they hatch. The larvæ are very active and are distinguished from those of other species by their short, black, barrel-shaped respiratory siphon and the grayish white color of their bodies. They hang at an angle of about 45° with the surface of the water. After 8 or 10 days (depending on temperature) they change into pupæ. These are mahogany brown, of rather graceful shape, and have shorter respiratory tubercles than the *Culex* or *Anopheles*. After two or three days they become mosquitoes. This mosquito is sly and persistent in its attacks, and frequently bites by preference just above the shoe tops. As in the other species of mosquitoes, it is the female only which bites. The young mosquitoes, which are very voracious, bite in the daytime, but the adults, the ones which do the mischief, prefer to bite at night, or in a darkened room.

#### Screening and Oiling Squads.

First, then, attack this insect in its breeding places. Cisterns are the most important, as they are the most numerous, and on account of the quantity of fresh, clean, quiet water they contain form ideal

breeding places. They must be screened. For this purpose, organize screening and oiling squads. The unit of these is—

- 1 foreman.
- 2 workmen.
- 1 wagon and driver.

Carpenters are best for this work. The wagon should be a covered delivery wagon drawn by a mule. (Horses do not stand the extreme heat well.) The wagon should be supplied with the following stores:

- 1 barrel kerosene oil.
- 1 spigot.
- 1 4-inch funnel.
- 3 cistern oilers.
- 4 1-gallon oil cans.
- 6 sail needles.
- 6 balls twine.
- 1 bolt cheese cloth.
- 200 cistern sleeves.
- 200 cistern springs.
- 2 pounds tacks.
- 4 tack hammers.
- 2 pair shears.
- 1 30-foot extension ladder.
- 4 sacks sand.
- 1 shovel.

In the morning the foreman sees that he has this amount of supplies on his wagon before he starts to work. If he needs more he should draw them from the storekeeper.

The best form of cistern is made of metal with a cone-shaped roof, having a small screened opening for the admission of air. The intake pipes are protected by a swinging door which opens to let water in, but when this has passed drops back tightly into place again. The overflow pipe is screened. Unfortunately, this form of cistern is only just coming into use in tropical countries, and the wooden vat-like container with its cracked upper rim and defective roof is the rule. It would be better if the cisterns could be screened with 18 or 20 mesh bronze wire netting, but this is expensive and cheesecloth is generally substituted. The top of the cistern should be roofed to prevent the cheesecloth from sagging and touching the water, thus allowing little pools to form on the cloth. The cheesecloth should then be tightly stretched over the cistern and about a foot down the sides. They should be frequently inspected and any rents in them repaired by means of a sail needle and a piece of twine. When the cheesecloth becomes rotten it should be replaced by a new one. The intake and outlet pipes must also be protected. The simplest way to do this is by inserting a footless white stocking with an internal spring which expands when released by the inserting hand. This holds the stocking firmly in place, allows the passage of water, but

does not permit the ingress or egress of mosquitoes. As a further precautionary measure a coating of kerosene oil one-eighth of an inch in thickness should be spread over the surface of the water. All breeding places should be emptied, oiled, or filled with sand. The municipality in which the epidemic occurs should be urged to pass an ordinance requiring the proper screening with wire of all cisterns by the property owners.

#### Location of Fever Cases.

The location of those sick of fevers—and in an epidemic of yellow fever all fevers must be considered suspicious—is not an easy matter. The more ignorant will hide their sick in the fear that they will be sent to the hospital and their places of business closed, while the better classes often act similarly to avoid fumigation of their premises and unpleasant notoriety. The people of the infected city must therefore be kept under constant surveillance. This need not be obtrusive or troublesome to householders, the frequent inspection of their cisterns offering a good excuse to look over the house. The main support, however, is the family physician. He is required by law to report all suspicious or yellow fever cases, and if treated with tact and courtesy he will be of the very greatest aid to the public health officials. If he is derelict in this duty, he is soon found out and punished by imprisonment or fine.

On taking charge of a ward the officer should try to call on all of the physicians practicing therein and should assure them that they will be treated in a courteous and ethical manner, that the treatment of their patients will not be interfered with in any way, and that all screening and other work by the ward forces will be done as quietly as possible in and around premises containing the sick. They should be asked to inform the ward headquarters of all suspicious and positive yellow fever cases as soon as they are discovered; also to report when the patient is well enough to allow final fumigation of the premises. A little tact at the beginning will save an immense amount of friction later on.

Cases must be reported early. The patient is infective to mosquitoes during the first three days only, after which time he is absolutely noninfective and his discovery is of aid only in that it allows a final fumigation of the house. Particular attention should be paid to the illnesses of children, as it is often by "missed" cases among them that the disease is perpetuated. Inspectors must endeavor to ascertain the nature of every case of sickness which occurs in their districts. This must be done carefully and without annoyance to householders. Inspectors must be reliable, tactful, observant, and of good address.



## Screening Squads.

Having discovered a positive or suspicious fever case, the patient must be kept in mosquito-proof surroundings until the first three days have passed or until the case has been proven not yellow fever. To put it another way, the mosquito must be protected from the patient. An 18 or 20 mesh bobbinet bar must be hung about the patient's bed and the room carefully screened. The unit of the screening squad is—

- 1 foreman.
- 2 workmen.
- 1 wagon and driver.

Carpenters are best for this work. The squad should be supplied with—

- 3 screen doors.
- 1 bolt 108-inch bobbinet.
- 75 feet one-quarter round strips.
- 75 feet one-half round strips.
- 75 feet 3 by 1 inch strips.
- 1 box each  $1\frac{1}{2}$ -inch, 1-inch,  $\frac{3}{4}$ -inch, and  $\frac{1}{2}$ -inch brads.
- $\frac{1}{2}$  pound each 4-penny, 6-penny, 8-penny, and 10-penny nails.
- 3 pounds tacks.
- 6 door pulls.
- 2 pairs shears.
- 1 dozen spring hinges.
- 6 spiral springs.
- 4 hammers.
- 1 box each  $1\frac{1}{2}$ -inch, 1-inch,  $\frac{3}{4}$ -inch, and  $\frac{1}{2}$ -inch screws.
- 2 18-inch saws.
- 1 box plane.
- 3 gimlets.
- 4 screw drivers.

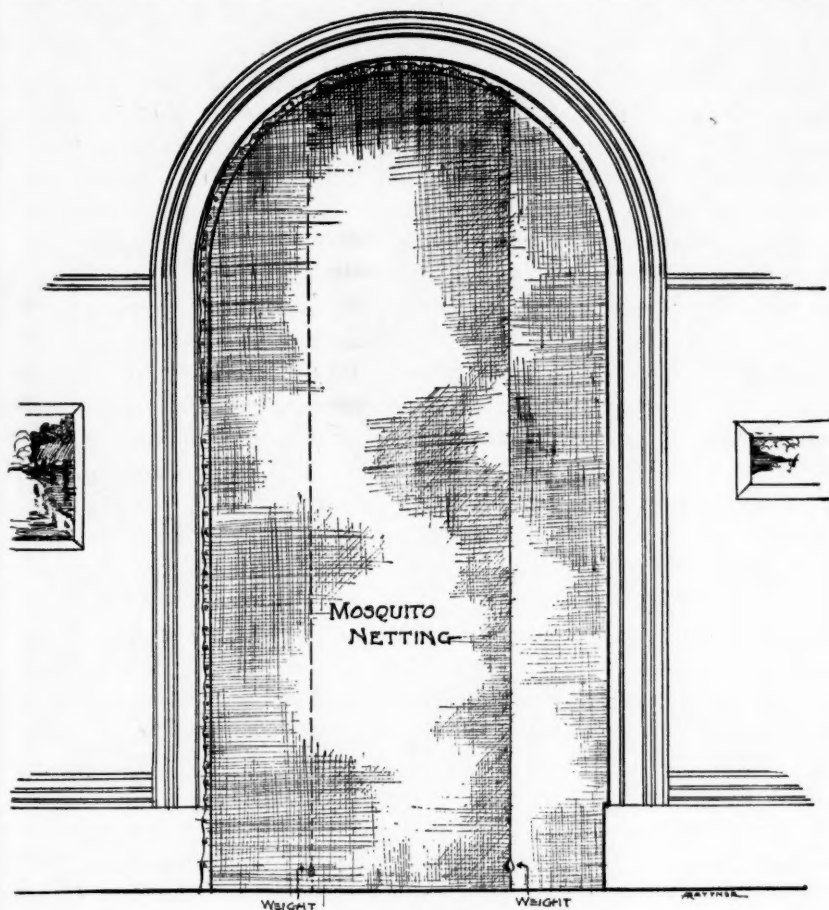
As soon as a case of yellow fever or suspicious fever is discovered by the ward forces it should be reported to the division of statistics. On the other hand, the division of statistics reports to the ward headquarters cases which they have received knowledge of from outside sources. As soon as the ward is cognizant of a case of yellow fever or suspicious fever a card<sup>1</sup> is made out and handed to the foreman of a screening squad, who proceeds immediately to the house of the patient and screens the sick room.

It is best to choose for the sick room one through which there will be little if any passing by the people of the house, and in such a location as not to interfere in any way with the primary fumigation of the premises. Patients should not be moved without the consent of the physician in charge of the case and then only under his direction or that of the ward commander or one of his medical assistants. As the patient is very sick at this stage of the disease, this work must be done as noiselessly as possible lest it annoy and excite him. Nails

<sup>1</sup> Appendix, Form 16.



must be driven with muffled hammers and gimlets and screws substituted for them whenever feasible. The windows are best screened



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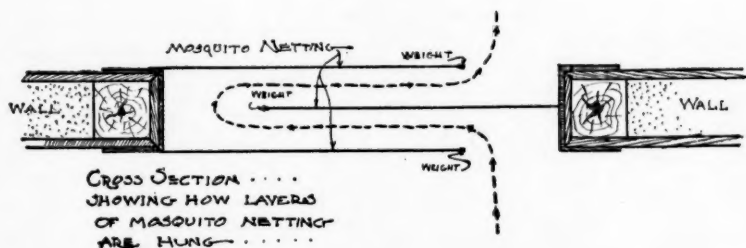


FIG. 1.—Triple curtain of bobbinet. Substitute for a screen door.

with bobbinet held in place by half-round strips. Adjustable window screens of wire have not been found practical for this work.

They do not fit well and are too easily slipped in and out of place without leaving any evidence of their having been tampered with. If the window has outside blinds, the bottom of the bobbinet screening should be left somewhat baggy in order to allow the closure of the blinds from within the room. If it is found that the screen doors are too large for the doorway it is desired to screen, they should be cut down. If they are too small, a strip should be nailed in place for a door jamb. If the supply of screen doors runs out, bobbinet may be substituted for them as shown in the accompanying diagram.

The bobbinet is nailed fast top and bottom with half-round strips. The different layers will hang close together when the "door" is not in use. Transoms are treated in the same way as windows. If the room has a large door like a double door or an arched opening into another room, a door frame may be built of 3 by 1 inch material and the openings around this closed with bobbinet. In every case the door should be made to fit tightly into a border of quarter round material. This is necessitated by the fact that the doors are very liable to warp. The door should be provided with a hook and screw eye on each side. A strong spiral spring should be run from the inner side of the door jamb to the outer side of the door and a warning card<sup>1</sup> tacked to the door. Other places through which a mosquito might enter a room, e. g., flue holes, fireplaces, and ventilator shafts, should also be screened or closed. When the house receives its final fumigation, all the screening should be taken down and returned to headquarters to be used on another case.

As soon as the foreman reports that he has screened the room, the work is inspected by the ward commander or one of his assistants. At the same time the information needed for the card index<sup>2</sup> is secured. This forms a part of the card index system of the office and is used in keeping track of the cases and in furnishing information regarding them for the division of statistics.

#### Primary Fumigation.

Next begins the primary fumigation. This may be divided into two parts, first, that of the screened room in which the patient is to be kept, and, secondly, the remainder of the premises. The unit of the fumigating squad is—

- 1 foreman.
- 5 workmen.
- 1 wagon and driver.

<sup>1</sup> Appendix, Form 17.

<sup>2</sup> Appendix, Form 18.

Each squad is furnished with the following supplies:

- 2 sacks sulphur if in flowers, 200 pounds if in roll.
- 40 12-inch iron pots.
- 40 14-inch tin pans.
- $\frac{1}{2}$  barrel paste.
- 3 bundles old newspapers.
- 10 rolls 3-inch gummed paper.
- 10 rolls 3-inch ungummed paper.
- 10 rolls 6-inch ungummed paper.
- 1 roll 36-inch manila paper.
- 10 boxes matches.
- 2 gallons alcohol.
- 2 gallons aqua ammonia.
- 20 lengths perforated stovepipe.
- 20 pounds copper sulphate, or saturated solution of same.
- 1 12 by 25 foot tarpaulin.
- 1 garden spray tank.
- 1 4-inch tin funnel.
- 2 pounds cotton batten.
- 6 paste brushes with handles.
- 25 yards Pepperell sheeting, 1 yard wide.
- 4 hammers.
- 4 screw drivers.
- 5 gallons camphor-phenol.
- 20 6-inch tin pans.

Each foreman should be given a copy of the following instructions:

#### Instructions to Foremen.

1. Foremen only shall ask permission to fumigate. In case of refusal, report to superior in the field or telephone headquarters. Laborers are not to adjust difficulties. All such are to be referred to the foreman, who alone is empowered to discuss matters with the householders.
2. Foremen shall on no occasion move patients unless an officer is present.
3. Foremen shall see that their wagons are fully equipped before leaving headquarters, and that special pots for sulphur and pyrethrum, to be used exclusively for each, are provided. As soon as possible after arrival at the house, foremen will make an estimate of the materials needed. These should be removed in the least possible time, thereby making it possible to dispatch the wagon to another place on short notice should it be needed.
4. Burn 2 pounds of sulphur to the thousand cubic feet of air space. Burn 3 pounds of pyrethrum to the thousand cubic feet of air space. Fill pans with sand, *never* with water.
5. Camphor is to be used only on special orders from an officer.
6. Foremen shall either leave in charge or send back a man to open the house on the completion of fumigation, and will be responsible for the man so left. The man left in charge of the house to be opened after the wagon has left the field shall take a memorandum of the material left in the yard, which must be collected as early as possible the next morning.
7. Foremen must keep track of the overtime of their squad. Foremen will leave a man to stop leaks at all primary fumigations. If your report has not been taken up by 4 o'clock p. m., phone headquarters the number of houses and rooms fumigated.

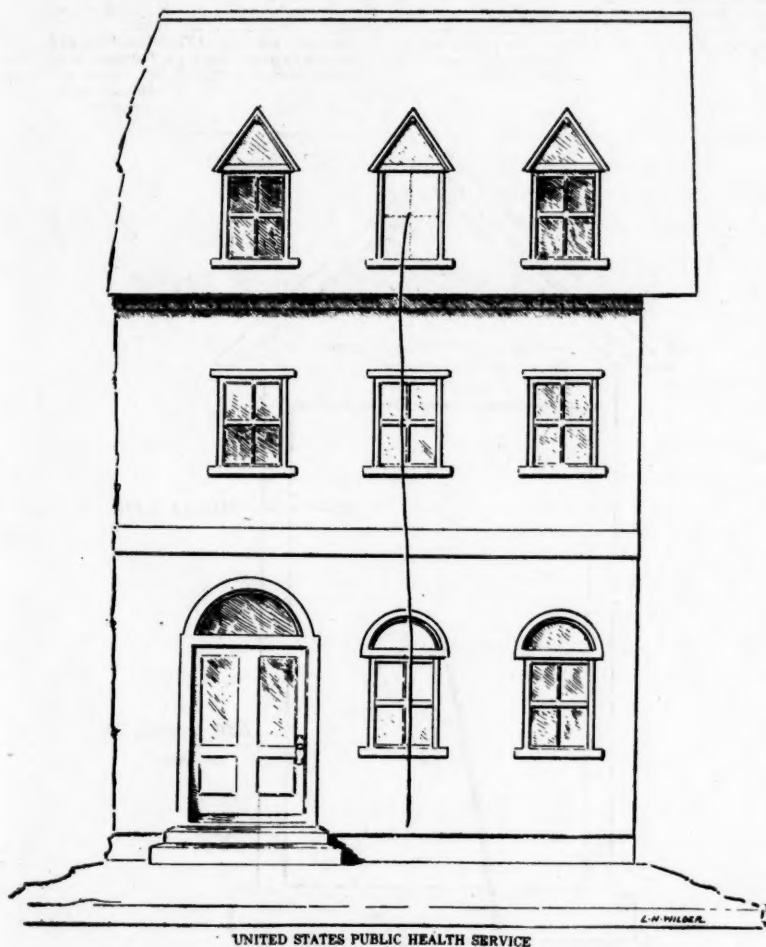
The room in which the patient is to be kept during his illness should be first fumigated, care being taken to keep him under a bed bar in another room until he is able to be taken into the fumigated room. After fumigation, this room should be thoroughly aired and the patient transferred. The remainder of the house is then to be fumigated.

All openings are to be closed with paper and paste, excepting those which are too large to be closed in this manner. For these latter, tarpaulins or Pepperell sheeting, covered with a thin coat of paint or having papers pasted thereon, are most excellent. Another way is to have frames of 3 by 1 inch, about 3 by 6 feet, covered with sheeting and then papered. These can be easily slipped into place where needed and a strip of paper pasted around their edges. In fumigation of sheds and outbuildings and similar more or less open buildings, it will be frequently necessary to construct almost a new house out of paper. For this purpose 36-inch manila paper will be found invaluable. For sulphur pots 12-inch three-legged skillets are best. The same style of pot should be used for pyrethrum, but pyrethrum should never be burned in pots which have been used for sulphur. Flowers of sulphur are preferable to roll sulphur for this work. It is more expensive, but the amount of time saved in cracking up roll sulphur, the inevitable waste in such a process, and the fact that flowers of sulphur will burn clean, while roll sulphur often will not, more than counterbalance the increased cost.

Anhydrous sulphur dioxide is lethal to mosquitoes. The pots, therefore, should not be placed in water, but in 14-inch pans containing dry sand. Before lighting sulphur or pyrethrum a conical depression extending from the center to the bottom should be made, and 50 cubic centimeters of alcohol poured in. Sulphur in the proportion of 2 pounds to the thousand cubic feet of initial air space is to be used where there is no bright metal work, paintings, or tapestries to be injured. Pyrethrum in the proportion of 3 pounds to the thousand cubic feet, or camphor-phenol 6 ounces to the same area, may be used elsewhere. In each instance the length of exposure is to be two hours. Pyrethrum is burned as is sulphur. Camphor-phenol is placed in small tin pans on top of a piece of perforated stovepipe having a lighted alcohol lamp at the bottom. This precaution is necessary, as the fumes are highly inflammable. It is also to be remembered that camphor-phenol is toxic to human beings, and great care is to be taken in entering the room before it has been well aired.

In fumigating buildings of more than three stories it has been found necessary to provide some means of readily and quickly airing the house on the completion of the fumigation. For this the following method was devised: Both sashes of a window on the top floor of the building were removed. A window on the street exposure was

generally chosen and all the doors opening onto the common hall were left open. The window from which the sashes were removed was closed with 36-inch manila paper. On the inner side of this window covering there was pasted in the form of a cross two pieces of rope. At the point where these crossed a long piece of rope leading to the



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FIG. 2.—Preparation of house for rapid ventilation after fumigation.

ground was fastened. When the time came to open the building the man left behind for that purpose first gave the rope a sharp pull. This tore out the entire paper covering of the window and when the doors below were opened a draft was created which quickly carried out the gas.

In considering the value of the three principal culicides the following short table may be of use.

	Sulphur.	Pyrethrum.	Camphor-phenol.
Toxicity, human.....	Toxic.....	Suffocative.....	Toxic.
Toxicity, mosquito.....	do.....	Not always toxic.....	Not always toxic.
Penetration.....	Deep.....	Poor.....	None.
Damage done to.....	Bright work, paintings, wall paper, tapestries, and upholstery.	Tarnishes gilding. If impure, deposits black film on walls or fabrics.	Softens varnish. Is in- flammable and under certain conditions may be explosive.
Cost.....	Cheap.....	Expensive.....	Expensive.

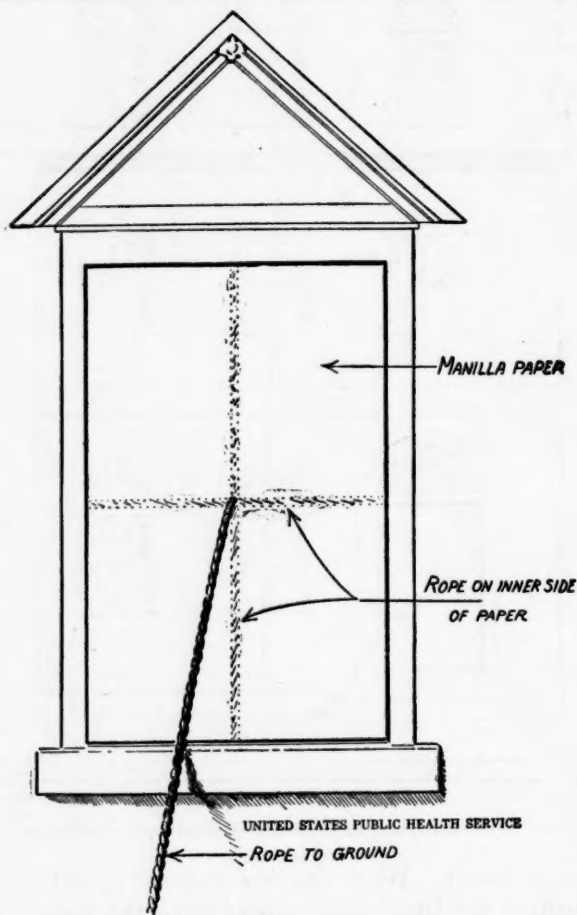


FIG. 3.—Detail of preparation of window for rapid ventilation after fumigation.

#### Contiguous Fumigation.

Following the fumigation of the infected premises, contiguous buildings should be fumigated, contiguous being used in the sense of contiguity from the mosquito viewpoint, i. e., the places which are suitable for oviposition. In those areas which are badly infested, or



where premises are so closely connected as to be practically one continuous building, it is sometimes found necessary to do block fumigation. For this purpose, a gang is placed on each face of the block and an attempt made to "fire" all the houses in the block simultaneously. In many places pools of water will be found under the houses. Whenever it is possible, salt is to be placed in these, but if as is very often the case they are not accessible, a saturated solution of copper sulphate is to be thrown into them by means of a garden spray pump. There are now on the market various culicides, usually consisting of phenols and cresylic acid compounds, which are also useful for this purpose.

Occupants of infected houses may remove any of their effects from the building before fumigation begins, destruction of infected or infectible mosquitoes, not of bacteria, being the desired result. In houses having fine woodwork, cotton batton may be chinked in and around doors and transoms to avoid injury to the woodwork by paste. Windows when fairly tight may be closed by means of small wedges of wood which are driven between the frame and the casing.

As soon as a patient dies or recovers, the place is given a second fumigation. Contiguous premises need not be fumigated at this time. Secondary fumigation should be done before allowing a funeral or a wake on infected premises. Infected houses must be kept under surveillance from the fifteenth to the thirtieth day after the discovery of the disease to watch for secondary cases.

In no case should officers or their assistants treat or give any advice regarding the treatment of cases. This is the province of the family physician. If no physician is in attendance, the relatives of the patient should be informed that they must secure a physician or send the patient to the public yellow-fever hospital. The rule to be followed regarding fumigation and other sanitary measures in and around infected premises is, "The patient belongs to his physician, but the house belongs to the sanitary officers."

Many will attempt to escape fumigation by leaving or locking up their houses. Such places should then be sealed.<sup>1</sup> This method has been found very efficacious. In case fumigation is strenuously resisted, the local police should be called upon to quarantine the house. The method of application is this: The policeman is ordered to allow anyone to leave the house, but no one to enter it. The householder in his excitement is apt to think this is a very easy way out of the difficulty, until he runs out to talk the matter over with his neighbor or to berate the sanitary forces. Then he suddenly finds himself unable to enter his own house, and as he is often hatless, generally coatless, hunger and exposure generally bring about a capitulation in an hour or two.

<sup>1</sup> Appendix, Form 19.

Sometimes rooms may be fumigated and closed until the end of the epidemic. In such a case a special seal<sup>1</sup> should be used.

#### Gutter Salting.

Under normal conditions the *Stegomyia (Aedes) calopus* does not breed in foul water, but it must be remembered that by screening the cisterns and filling her other natural breeding places, an unnatural condition is being created. It is possible under these conditions that she may oviposit in gutters. These then should be salted with rock salt in the proportion of 500 pounds to the face of each block. For this purpose salting squads are necessary. Their unit is—

- 1 foreman.
- 4 workmen.
- 4 wagons with drivers.

Each wagon is supplied with two scoop shovels.

#### The Day's Work.

The following is an outline of an ordinary day's routine in a busy ward:

7 a. m.—Roll call and inspection by the ward commander. This inspection serves two purposes: First, it affords the ward commander an opportunity to speak to the entire force and issue any general orders that may be necessary. Secondly, he has a chance to look into the physical condition of his men. If any of them are in the early stages of yellow fever, he should be the first one to know it, in order that he may send the man to his home for proper treatment to prevent his spreading the disease. This is important. No man with any fever should be allowed to go to work, neither should any with the remains of a last night's drunk. After roll call and inspection the ward commander may take occasion to issue any general orders or make any remarks he may see fit. This offers a good chance to get close to the men and to arouse their esprit de corps. Discipline must in the nature of things be strict, but it is impossible to watch the men all the time, and they must be left to discipline one another. If they know that if ward supplies are stolen or houses under fumigation looted their entire squad will be called upon to produce the guilty party, they will take care that nothing of the sort occurs.

After roll call the foremen draw their supplies from the storekeeper, giving him a receipt therefor. They set their squads to loading the wagons and turn in an account of the overtime of their squads on the previous evening. The inspectors secure inspection blanks and pencils and are given for correction any unfinished or improperly filled blanks from the preceding day. They are assigned their districts and any special work for the day. Foremen are given a list of places at which to begin work. Those gangs not sent into the field are employed in cleaning sulphur pots, making paste, mending screen doors, cleaning the storeroom, and similar tasks. Wagons for which there is no immediate call should be sent to the purveying depot for supplies or sent out collecting pots and pans left at places fumigated on the previous afternoon.

7.30 a. m.—All gangs take the field. If the family at whose house fumigating is to be done are not through breakfast, or for any other good reason are not quite ready for fumigation, the foreman should have the sulphur pots unloaded and charged, and the

<sup>1</sup> Appendix, Form 20.

other supplies, paper, paste, brushes, etc., placed where they are needed so that operations may begin with the least possible loss of time.

Salt gangs should drive to railroad yards, load their wagons with salt, which is kept in box cars on a siding, and commence salting gutters in their district.

At the same time inspectors go out so as to be at work in their districts not later than 8 a. m. Besides getting the information called for on the inspection blank, they should note the visits of physicians in the neighborhood and find out, if it can be done quietly, who is ill in the house the physician visits, and possibly the nature of the disease. The visits of undertakers and the occurrence of funerals is also noted, and if deemed necessary the facts should be reported to the ward headquarters by telephone.

The screening and oiling squads also take the field. If there has been a heavy rain-storm they inspect their district and repair any damage which may have happened to cistern covers, at the same time emptying any barrels or other unscreened containers which may have filled with storm water.

The screening squads start out on unfinished work from the previous day or collect screen doors or other paraphernalia left at houses which have had their final fumigation. If there is no immediate field work for them, they should be set to repairing or making screen doors and sharpening the saws and planes.

All foremen should be instructed to report to ward headquarters as soon as they have finished the work laid out for them. They can then be given other work or ordered in from the field. It is bad policy to have idle squads out in the ward. They get into mischief and it lays the ward commander open to the criticism that he is employing more men than he needs or is not properly managing those he has.

12 m.—All field employees stop work. In the office turn is taken in going to lunch. This precaution is taken in order that there shall always be some one to answer the telephone or receive citizens, many of whom have no other time to visit the headquarters with reports or complaints. On very hot days when it is not safe for white men to do heavy work in the glaring noonday sun, two hours may be allowed for lunch. As a rule this is not needed, and as it is not desirable under ordinary circumstances to do fumigating or other field work at night every moment of the day must be utilized. The men should be encouraged to take their lunch in the field. Those taking too much beer with their lunch should be summarily discharged.

1 p. m.—Work recommenced.

4 p. m.—Foremen in the field whose reports have not been taken up send them in by telephone. This is necessary in order to facilitate the daily report to the commanding officer.<sup>1</sup>

5 p. m. All inspectors report at ward headquarters and turn in their report for the day. All field squads not told off for overtime work come in, unload their wagons, and put their supplies in the storeroom, the foremen taking back the receipt they gave in the morning. Foremen turn in their final reports of the day's work in writing and leave memoranda of men left in the field to open houses. All gangs still in the field are visited by an officer who estimates the amount of work still to be done on the task then in hand, in order that there may be no overcharge for overtime. Squads are told off for the fumigation of stores and other buildings which can not be fumigated in the daytime. The daily report to the commanding officer is made up and sent to headquarters by the office boy.

Other than their protection from mosquitoes the sick need not in any way be isolated after the primary fumigation of their premises. They may receive visitors as far as their physical condition will allow and public funerals may be permitted after fumigation of the

<sup>1</sup> Appendix, Form 21.

house. Business in infected towns may go on uninterruptedly and with the exception of the closure of places of public congregation at night there is little interference with life in the infected city. Freight may be shipped in and out without fear of transmittal of the infection if precautions are taken that neither the goods shipped nor the cars carrying them harbor mosquitoes.

Citizens can aid most by screening their cisterns and ridding their premises of mosquito breeding places and in raising funds for the prosecution of the sanitary work. If they do these things well they have all they can attend to. They should not be encouraged to do their own fumigation. They almost invariably do it improperly and it gives them a false sense of security. It also interferes very greatly with the work of the sanitary forces, as they resist fumigation on the ground that they have already done it for themselves and do not need it.

At the close of the epidemic all property should be placed in as good condition as possible and turned into the hands of some responsible custodian, his receipt being taken. Sulphur pots should be burned out, scrubbed in vinegar, and given a coat of plumbago or stove blacking to keep them from rusting. Materials which are salable should be sold and the moneys thus secured turned back into the epidemic fund.

#### Discharges.

Men who have served with credit are deserving of some certificate of their ability. A discharge is a good way to do this.<sup>1</sup> It not only gives the man a recommendation on which to obtain work elsewhere but is useful in hiring men to serve in another campaign. The issuance of these should be under the care of the executive officer. He has the discharges made out on the recommendation of the ward commanders, presents them to the commanding officer for his signature and delivers them to the ward commander. He keeps two records of each discharge, showing his ward, length of service, and character. One record is filed at general headquarters at the close of the work. The other is kept by the ward commander.

#### Rural Campaign.

The principles which underlie the yellow-fever campaign are the same whether it is to be carried on in the city or country, but the application of them may be very much altered by local conditions. The campaign in the country may be divided into three parts, viz: Diagnosis, extermination, and education. Little need be said with reference to the first, as it has been already well discussed in the Service manuals on the subject. The diagnostic outfit devised by

<sup>1</sup> Appendix, Form 22.

Surg. G. M. Guiteras (p. 146, Report Surgeon General, Public Health and Marine Hospital Service, 1906) may be used with great benefit and success. In the early part of the campaign, exceptional care should be taken in diagnosing cases, to prevent towns from quarantining neighboring cities which may be innocent of the disease. After a town has become infected and the actual work of extermination has begun, a "sanitary diagnosis" may be made and all fevers considered guilty until proven otherwise. In visiting towns for the purposes of inspection, the mortuary records should be investigated, and all deaths for the preceding six weeks looked into. A house-to-house inspection of the neighborhood in which such deaths have occurred often discloses yellow-fever cases which would have otherwise remained undiscovered. The diagnosis of malaria, cancer of the stomach, uremia, or cerebral congestion appearing on a death certificate should arouse the inspectors' suspicions. A call should be paid on all the physicians of the town. They may have cases which they desire to talk over with the inspecting officer or to show to him.

The plan of extermination in the country is the same as in the city, modified only by distances and lack of conveniences. The town authorities should be urged to pass a screening and oiling ordinance and every aid accorded the local board of health in formulating and applying appropriate prophylactic and suppressive measures. To this end oiling, fumigating, screening, and inspecting squads should be organized and thoroughly instructed in their duties.

Perhaps the most important work is that of educating the general public in regard to the mosquito doctrine and life habits of the *Stegomyia (Aedes) calopus*. It is surprising how readily the great bulk of the population will believe if the matter is put before them in an interesting way, devoid of all technicalities. Large drawings or photographs mounted on strong cards which may be passed from hand to hand are useful in fixing the lecture in the minds of small audiences. For larger ones a stereopticon or projector is very useful.

#### Outline of Popular Lecture.

The following has been found a useful outline to follow in speaking to lay audiences:

Finlay. His hypothesis. Its reception by the scientific world. Laveran. The malaria organism. The work of Ross. Life cycle of malaria parasite. Parallelism between malaria and yellow fever. The work of Reed. Repetition of his experiments by others. Examples to prove conveyance by *Stegomyia (Aedes) calopus*. Nothing remarkable that yellow-fever organism is transmitted only by the *Stegomyia (Aedes) calopus*. One kind of tape worm transmitted by pork, another by beef, etc. The life habits of the *Stegomyia (Aedes) calopus*. Breeding places. Why the female requires blood.



Yellow-fever patients dangerous to mosquitoes in first three days, therefore screen promptly every one falling sick for the first three days of illness. Twelve to 14 days elapse from receipt of blood by mosquito until it can transmit the disease. Why? Because of the development of organism in mosquito just as in case of malaria organism. How to prevent breeding of *Stegomyia (Aedes) calopus*. How to kill those already developed. How to assist the health authorities in their work.

#### In Conclusion.

These, then, are the general principles underlying yellow-fever warfare and the methods of their application. Others may have different ways which are just as good of accomplishing the same ends. As they are not known to the author, what has been laid down here is the result of his own experience and observations under the tutelage of that veteran yellow-fever fighter, Surg. J. H. White. Some of the methods given are the writer's, far more are those devised by other officers, and still others have been derived from unknown sources. Thus the article is in a measure as was Ulysses, "A part of all that I have met." As time goes on and scientific research definitely determines the etiological agent of yellow fever, our diagnostic methods will be revolutionized, but the measures to be taken for prophylaxis and suppression are not apt to suffer any marked change.



## APPENDIX.

### FORM 1.

*District No. .... Case No. ....*

1. Name: ..... Date: ....., 19...
2. Address: .....
3. Nationality: ..... Color: ..... Age: .....
4. Physician: .....
5. Where has he been in the last week: .....
6. When taken sick: .....
7. Where taken sick: .....
8. When was case investigated: .....
9. By whom was case investigated: .....
10. When was room screened: .....
11. By whom screened: .....
12. When was house fumigated: .....
13. By whom fumigated: .....
14. When was first case in house: .....
15. When was next case in house: .....
16. How and when terminated: .....
17. Remarks: .....
18. (Any and all information will be useful.).....

Blank to be used in recording reported cases. As this is only a temporary record, it should be printed on thin paper, so that carbon copies may be made and sent to ward commanders.

### FORM 2.

*Suspicious cases reported by physicians.*

1. Name: ..... Date: ....., 19...
2. Address: .....
3. Nationality: ..... Color: ..... Age: .....
4. Physician: .....
5. Where he had been in the last week: .....
6. When taken sick: .....
7. Where taken sick: .....
8. When was case investigated: .....
9. By whom was case investigated: .....
10. When was room screened: .....
11. By whom screened: .....
12. When was house fumigated: .....
13. By whom fumigated: .....
14. When was first case in house: .....
15. When was next case in house: .....
16. How and when terminated: .....
17. Remarks: .....

Index card to be used for recording suspicious cases reported by physicians.

## FORM 3.

*Physicians reporting suspicious cases.*

Physician: ..... Address: ..... Date: ....., 19...

Patient: ..... Address: .....

.....

.....

.....

.....

## FORM 4.

*Positive case card.*

1. Name: ..... Date: ....., 19...
2. Address: .....
3. Nationality: ..... Color: ..... Age: .....
4. Physician: .....
5. Where has he been in the last week: .....
6. When taken sick: .....
7. Where taken sick: .....
8. When was case investigated: .....
9. By whom was case investigated: .....
10. When was room screened: .....
11. By whom screened: .....
12. When was house fumigated: .....
13. By whom fumigated: .....
14. When was first case in house: .....
15. When was next case in house: .....
16. How and when terminated: .....
17. Remarks: .....

## FORM 5.

Address: .....

Name: ..... Age: .....

Nationality: .....

Physician: .....

Date: ....., 19...

Reported suspicious: Date: ..... Positive: Date .....

Street address index card.

## FORM 6.

*Physicians reporting positive cases.*

Physician: ..... Address: ..... Date: ....., 19...

Patient: ..... Address: .....

.....

.....

.....

.....

.....

Index card for physicians reporting positive cases.

## FORM 7.

*Emergency Hospital.*

Patient: .....

Address: .....

Day of illness: .....

Nationality: ..... Age: .....

Date of admission: .....

How terminated: ..... Date: ....., 19...

Index card of cases treated at hospital.

## FORM 8.

Patient: .....

Address: .....

Age: ..... Color: ..... Sex: .....

Birthplace: ..... Place of death: .....

Cause of death: ..... Date of death: ....., 19...

When reported as death: ..... When reported as case: .....

Signer of certificate: .....

Remarks: .....

Index card of deaths.

## FORM 9.

*Death street card.*

Patient: ..... Age: .....

Address: .....

Nationality: .....

Physician: .....

Date: Reported, (S).....; (P) .....

Died .....

Index card of deaths by streets.



## FORM 12.

*United States Public Health Service, General Supply Agency.  
Requisition Record.*

No. ....

Requested by: ....., 19...

Requisition signed by: ..... Time: { ..... A. M.  
..... P. M.

Receipt signed by: ..... Received by: .....

All bills checked.

Number.	Articles.	Ordered from.			Time.
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....

Index card record of supplies purchased and issued.

## FORM 13.

*Inspector's report.*

Ward No. .... Street No. ....

Number of persons living in premises: .....

How many sick since April 1: .....

What disease: .....

What physician attended: .....

Is cistern oiled, and is it properly screened: .....

If oiled, when was it oiled: .....

What is condition of privy vault: .....

Has it been oiled, and when: .....

Any wells, pits, or holes on premises containing water: .....

Any barrels, tubs, flower pots, cans, or other receptacles containing water: .....

Are there any gutters containing stagnant water: .....

What is general sanitary condition of premises? Give details if not good: .....

General remarks and recommendations.

(Under this head, if lot is empty, state whether there is any stagnant water on it.)

Name of inspector: .....

Place and date: ....., 19...

Inspection report blank.

## FORM 14.

..... Street. Name: .....

Persons in premises: ..... Sick since April 1: .....

Disease: ..... Physician: .....

Cistern oiled: ..... When: ..... Screened: .....

Screening repaired: ..... When: .....

Stagnant water: .....



Sanitary condition premises: .....  
 Warning issued: ..... Affidavit made: .....  
 Inspected: ..... Reinspected: .....  
 Remarks: .....

Index card of sanitary survey.

FORM 15.

*Initial requisition.*

5 barrels kerosene oil.  
 5 spigots.  
 6 4-inch tin funnels.  
 12 cistern oilers.  
 50 sail needles.  
 50 balls cotton twine.  
 50 bolts cheesecloth.  
 1,000 cistern sleeves.  
 1,000 cistern springs.  
 50 pounds tacks.  
 40 tack hammers.  
 12 pairs shears.  
 5 30-foot extension ladders.  
 10 shovels.  
 75 screen doors.  
 10 bolts 108-inch bobbinet.  
 500 feet  $\frac{1}{4}$ -inch round strips.  
 500 feet  $\frac{1}{4}$ -inch round strips.  
 500 3 by 1 inch strips.  
 10 boxes each  $1\frac{1}{2}$ -inch, 1-inch,  $\frac{3}{4}$ -inch, and  $\frac{1}{2}$ -inch brads.  
 10 pounds each 4-penny, 6-penny, 8-penny, and 10-penny nails.  
 100 door pulls.  
 75 pairs hinges.  
 100 spiral springs.  
 20 hammers.  
 10 boxes each  $1\frac{1}{4}$ -inch, 1-inch,  $\frac{3}{4}$ -inch, and  $\frac{1}{2}$ -inch screws.  
 10 18-inch saws.  
 5 box planes.  
 15 gimlets.  
 24 10-inch screw drivers.  
 1,000 pounds sulphur.  
 150 12-inch 3-legged skillets.  
 150 14-inch tin pans.  
 5 barrels paste.  
 25 bundles old newspapers.  
 100 rolls 3-inch gummed paper.  
 100 rolls 3-inch ungummed paper.  
 10 rolls 36-inch manila paper.  
 20 gallons alcohol. (Color this with methyl-grün to keep the men from drinking it.)  
 20 gallons aqua ammonia.  
 5 gross matches.  
 5 12 by 25 foot tarpaulins.  
 5 garden spray tanks.  
 20 pounds cotton batten.  
 24 paste brushes, 8 inch.  
 100 yards pepperell sheeting.  
 5 gallons linseed oil (boiled).  
 250 pounds pyrethrum.  
 100 pounds carbolic acid.  
 100 pounds camphor.  
 20 lengths perforated stove pipe.  
 5 dozen pencils with erasers.

Initial requisition for a moderately infested ward.

**FORM 16.**

*Report on bar supply and screening.*

Street: ..... No. ....

Between ..... and .....

Name: ..... Physician: .....

Character of case (Suspicious of yellow fever: .....

Character of case { Yellow fever: .....

Bars supplied: ..... Screened { Windows: .....  
Doors: .....

{Doors: .....

Still to be screened: ..... { Hour started: ..... a. m.

{ Hour returned: . . . . . p. m.

Date: . . . . ., 19. . . .

(Signed) ..... Crew.

[Make remarks on back of card, at top.]

Index card, report on bar supply and screening.

## FORM 17.

*Warning.*

This screen door must not be left open a minute for any reason whatever. If this screen door is found broken or propped open, or the netting of the doors or windows torn or cut, it will be sufficient cause to remove the patient to the Emergency Hospital.

## Avviso

Questa porta di rete devono tenersi sempre chiusi e mai aprirla per nessuna ragione. Se per caso una di queste porte si troverà aperta, o rotta, o la rete stracciata, positivamente l' ammalato sarà trasportato all' Ospedale di Emergenza.

Warning card to be tacked on screen doors after installation.

## FORM 18.

1. Name: ..... Date: ....., 19...
2. Address: .....
3. Nationality: ..... Color: ..... Age: .....
4. Physician: .....
5. Where has he been in the last week: .....
6. When taken sick: .....
7. Where taken sick: .....
8. When was case investigated: .....
9. By whom was case investigated: .....
10. When was room screened: .....
11. By whom screened: ...
12. When was house fumigated: .....
13. By whom fumigated: .....
14. When was first case in house: .....
15. When was next case in house: .....
16. How and when terminated: .....
17. Remarks: .....

2. Address: .....

3. Nationality: ..... Color: ..... Age: .....

4. Physician: .....

5. Where has he been in the last week: .....

6. When taken sick: .....

7. Where taken sick: .....

8. When was case investigated: .....

9. By whom was case investigated: .....

10. When was room screened: .....

11. By whom screened: ...

12. When was house fumigated: .....

13. By whom fumigated: .....

14. When was first case in house: .....

15. When was next case in house: .....

16. How and when terminated: .....

17. Remarks: .....

Index card of sanitary treatment of yellow fever cases.

**FORM 19.**

**SEALED!**

By the

United States Public Health Service

and

The City Board of Health of .....

## OWNER, AGENT, AND OCCUPANT ABSENT.

This seal must not be broken without permission from Headquarters of the United States Public Health Service in this ward.

Address: .....

Form used in sealing empty houses.

## FORM 20.

If this seal is not  
broken, the room  
will not require  
further fumigation.

Form used in sealing rooms which are not fumigated. These are usually left in place until after frost.

## FORM 21.

*Daily summary.*

Date: ....., 19..

Ward No. ....

Premises inspected, number: .....

Rooms screened, number: .....

Rooms fumigated, number: .....

Number cases reported to ward headquarters for screening and fumigating: .....

Cases (yellow fever and "suspicious") discovered and reported to central office: .....

Total sick investigated: .....

Premises reinspected for secondary cases: .....

Remarks: .....

.....  
..... Surgeon, U. S. P. H. S.

Blank for daily report to commanding officer.

## FORM 22.

## THE PUBLIC HEALTH SERVICE OF THE UNITED STATES.

[Seal.]

*To all whom it may concern:*

Know ye, that ....., who has been employed in the ..... of the city of  
....., from ....., 19..., to ....., 19..., is  
hereby honorably discharged from the Public Health Service of the United States by  
reason of the close of the yellow-fever epidemic of 19....

.....  
..... Surgeon, Commanding.

## CHARACTER.

No objection to his reemployment is known to exist. Capable and industrious.  
A good foreman and fumigator.

.....  
..... Surgeon, Commanding ..... Ward.

Form of discharge issued to employees.

